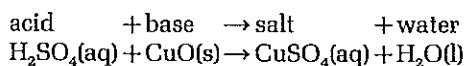


7.5 Preparation of copper(II) sulphate from copper(II) oxide

The reaction between dilute sulphuric acid and copper(II) oxide is a typical example of a reaction between an acid and a base to form a salt and water.



Copper(II) oxide is insoluble in water whereas copper(II) sulphate is soluble. The copper(II) oxide is added to the acid until the acid is completely neutralized. The excess copper(II) oxide can then be filtered off leaving copper(II) sulphate solution only.

The reaction is more rapid if hot sulphuric acid is used.

Aim

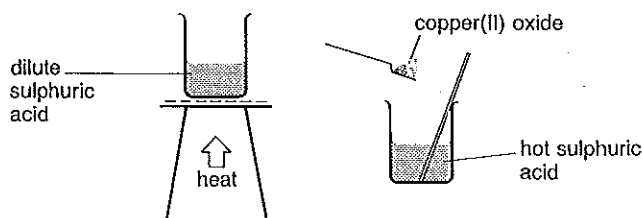
To prepare crystals of copper(II) sulphate-5-water from copper(II) oxide.

Apparatus and materials

Beaker, 100 cm³
Measuring cylinder, 25 cm³
Tripod and gauze
Bunsen burner and mat
Filter funnel
Filter paper
Glass stirring rod
Evaporating basin
Stand, boss and clamp
Spatula
Cloth or paper towel
Microscope
Dilute sulphuric acid, 1 mol dm⁻³
Copper(II) oxide

Procedure

- 1 Use a measuring cylinder to pour 25 cm³ of dilute sulphuric acid into a beaker.
- 2 Heat the beaker and its contents on a tripod and gauze until the acid is about to boil.
- 3 Remove the Bunsen burner from underneath the tripod and gauze.



- 4 Add copper(II) oxide, one spatula measure at a time, to the hot acid. Stir the mixture with a glass rod after each addition.
- 5 Continue to add copper(II) oxide until no more will dissolve. Only a small amount of copper(II) oxide should remain.
- 6 Hold the hot beaker with a cloth or paper towel. Filter the hot solution into an evaporating basin.
- 7 Place the evaporating basin on a tripod and gauze. Heat it gently until half the volume of liquid remains.
- 8 Remove the evaporating basin from the gauze. Place a piece of paper over the evaporating basin and leave the solution to cool.
- 9 When crystals appear remove some of them with a spatula. Dry the crystals between two sheets of filter paper.
- 10 Examine the crystals under a microscope. Select the best crystal and sketch its shape.
- 11 Using adhesive tape stick small samples of copper(II) sulphate crystals and copper(II) oxide into your exercise book.
- 12 Label the samples.

Extra work

- Prepare other salts by this method for example lead(II) nitrate from lead(II) oxide.
- Carry out the experiment quantitatively by weighing the copper(II) oxide used and the amount of copper(II) sulphate crystals produced in the experiment. Note that excess copper(II) oxide is used.

Questions

- 1 a) Describe the colour change that occurs in the experiment.
b) Why is the dilute sulphuric acid heated?
c) Why is the solution of copper(II) sulphate not heated to dryness?
d) Why should copper(II) oxide remain at the end of the experiment?
e) Why must a large excess of copper(II) oxide be used?
- 2 Name five salts that could be prepared by a similar method to that used to make copper(II) sulphate. In each case name the starting materials and write an equation for the formation of the salt.